

Weekly Report for 02/09/2015

Highlights

- Served on Director's Review Committee for LCLS-II CD3b at SLAC. (Kathy Harkay)
- Co-inventor on U.S. Patent 8,951,671 issued for ternary acetylides as alkali-metal intercalation electrodes for batteries. (Kathy Harkay)

APS Renewal and Upgrade

- Began some parametric simulations of current limit as a function of number of flanges, absorbers, and the like. Some results were surprising - decreasing the number of absorbers is predicted to increase the current limit. It appears that the effect is associated to very longitudinal effects - the bunch length and energy spread oscillate by 10-20% (or more). I will have to be more careful when assessing "stability" in the future. (Ryan Lindberg)
- Contacted the author of synrad3d, the Cornell 3D synchrotron photon tracking code, David Sagan, to report a run error, which he debugged. R. Soliday installed the new version and I successfully ran a test file. L. Boon compared the output to the same test file run at Cornell. Started preparing for the Synrad3d Training for APS Upgrade personnel. (Kathy Harkay)
- Setup HHC for future simulation. Discussed with Michael on how optimized HHC setup could be changed due to ID gaps. Discussed with CY and Vadim on synchrotron phase variation and injection issues. (Aimin Xiao)
- Setup IBS simulation for MBA optics. (Aimin Xiao)
- Setup Touschek simulation for MBA optics. (Aimin Xiao)
- Attended MBA Physics meeting; will get involved with high-charge PAR measurements. (Jeff Dooling)

MCR Operations

Linac Operations

- RG1 study time (2-10-2015) was dedicated to rf conditioning followed by Cathode activation and beam operations. (Stan Pasky)
- Rf condition went very well. I was able to condition the 3G3 gun cavity to 3.5MWatts with a 1?s pulse in about 4 hour. Vacuum levels on the cavity and input waveguide never reached a level higher than 5×10^{-8} . (Stan Pasky)
- Next goal was to see how the cathode would perform after previous processing to ~28watts. (Would like to note - saw little to non increase in vacuum activity on the gun vacuum pumps) I increase the gun cathode to ~12 - 15watts followed by increasing the rf power to 3MWatts. Unfortunately I didn't see any charge on the first current monitor at this point and gun vacuum indication was in the ~10-9. (Stan Pasky)
- To stimulate the cathode in hopes to experience activation, I proceeded to increase the gun cathode in small steps with no success. The highest wattage indication was ~28watts. At this point I stopped for the evening and left the cathode at ~20watts for baking. (Stan Pasky)
- The following morning I returned to see if any charge would occur when up as high as 31watts. After some discussion with the vacuum group they indicated the cathode could be poisoned or not enough heat was getting to the cathode. (Stan Pasky)
- Gun replacement pending!! (Stan Pasky)
- Worked with S. Pasky during machine studies to condition RG1. Though the gun conditioned up to

full rf power (3.5 MW), found that even at the highest cathode heater power, the cathode produced no extractable current. (Jeff Dooling)

- Normally cathode heater power is set below 20 W; however raising the power first to 28 W, then 32 W, and finally 37 W produced no output. (Jeff Dooling)
- Will replace the 3G3 gun with the 3G1 gun during the 48-hour maintenance period starting March 2nd; the latter gun is presently installed in the ITS. (Jeff Dooling)
- Found through a handling mistake, citranox contaminated the MG300 cathode, probably destroying it. Believe we have spare cathodes, J. Hoyt (AES-MOM) will check. (Jeff Dooling)

APS Machine Studies

Storage Ring Studies

- Repeated SCU0 BBA to compare with measurements during startup before the S7A:P1 offset was remeasured (snubbers). The vertical chamber alignment is the same; not affected much by the offset update. (Kathy Harkay)
- Checked ID4 BPMs (P0s and P1s) linearity from previous dispersion measurement. They appear to be good. (Aimin Xiao)

Linac Studies

- Gathered and studied thermionic gun kicker documents. Discussed kicker waveform changes with power group. analyzed kicker waveform in the past 4 years in order to understand recent changes in the kicker waveform (narrower than it ever had been). Wrote findings in a tech note AOP-TN-2015-003. (Yin-e Sun)
- Worked on the RG2 beam tune up. Got good charge and transportation, met PAR charge requirement without having to raise gun average current, or change gun kicker waveform. But will need to revisit in order to restore L2 quads to its reference file settings. (Yin-e Sun)

APS Machine Research and Development

Storage Ring Research and Development

- Carried out elegant beam loss analysis for faster (single-turn) abort kicker waveforms from J. Wang. Ran 20 different cases for comparison, and extended analysis to three full turns. Made a table for technical note. (Kathy Harkay)
- Carried out elegant analysis for ID1 beam loss studies with IK1 kicker. Added vertical and horizontal bumps to look for favorable kick values. Showed results to J. Dooling. (Kathy Harkay)
- Analyzed SCU0 cryogenic data for 324 bunch operation at 100 mA and 150 mA, and discussed with Y. Ivanyushenkov. He incorporated my plots into several PPT slides. We forwarded the summary to A. Zholents. (Kathy Harkay)

Booster Research and Development

- Search Y.-C. Chae's files for signs of a booster impedance model. None were found. I will consult with C.Y. (Ryan Lindberg)

Linac Research and Development

- Presented results of recent pcgun drive laser measurements at the Photoinjector Physics (PiP) meeting. (Jeff Dooling)

- Continued analysis of pcgun laser beam transport. (Jeff Dooling)
- Delivered samples of corrosion taken from the 3G3 gun and citranox to McCrone Associates (Westmont, IL) for analysis. The 3G3 gun was recently installed in RG1. (Jeff Dooling)
- Run PC gun at the linac front end. Attempted to generated photo-electrons but need more laser work to get laser to hit the cathode. (Yin-e Sun)

Other Research and Development

- U.S. Patent 8,951,671 issued: TERNARY ALKALI-METAL AND TRANSITION METAL OR METALLOID ACETYLIDES AS ALKALI-METAL INTERCALATION ELECTRODES FOR BATTERIES. Co-inventor with K. Nemeth and others. (Kathy Harkay)

APS Machine Software

Storage Ring

- tested holdVCPosition script with Bob Lill, fixed several bugs and improved it so that it waits for the position cool down if overshoots and start turn on/off again if the position goes below setpoint. Bob has started to use it for holding S25 BPM positions, worked fine. The S27 BPMs (which was controlled by holdVCPosition) are much more stable than S28 BPMs, (Hairong Shang)
- modified and tested ID4 aperture scan ExpeerimentDesginer application for Yipeng Sun, (Hairong Shang)
- debugged the gap scan problem that it could not move ID01ds gap, it turned out that ID01ds changed from linear to rotary encoder, and because of the lesser accuracy of the the rotary encoder, it hit a limit switch in the tunnel. Control guys changed the devicelimit to 10.95 from 10.90 to avoid this problem. (Hairong Shang)

Injectors

- converted QF, QD current (which was created from BM current by CY) to booster current Waveform and combined with current booster IRamp reference to create new IRef with updated QF, QD. (Hairong Shang)
- improved AcquireLinacWaveforms: made it able to change the x-axis plot range for plotting RF gun kicker waveform and improved the plot radio button to automatically change the default plot range when selecting plot types. (Hairong Shang)
- cleaned up the suspend/resume ramp auto-correction in Booster Energy Saver application (RampTest) since it is no longer needed and has been commented out. (Hairong Shang)

General

- studied python EPICS, and added precision preference to gnome pvapplet to be able to change the display precision for numeric PVs, tested and installed on tulip. Submitted to IT for installing on all workstations. (Hairong Shang)
- added pv testing to run statistics in ExperimentDesigner so that it is able to suspend statistics measurement when there are pvs out of testing range, this makes sure that valid data are being taken for statistics measurement. (Hairong Shang)

Publications, papers and report

- Continued updated figures and text in response to referee comments on SCU0 paper. (Kathy

Harkay)

- Continued working on Abort Kicker technical note. (Kathy Harkay)

Meetings, workshops, conferences, committees, LMS related, and reviews

- Reviewed paper for PRST-AB on simulation of self-seeding in FELs. (Ryan Lindberg)
- Served on Director's Review Committee for LCLS-II CD-3b at SLAC, on the Accelerator Systems subcommittee. Contributed to the closeout report. (Kathy Harkay)
- Arranged a Beams and Applications seminar for Feb 26. (Kathy Harkay)
- Hold a photo-injector physics meeting to discuss the thermionic gun re-engine work (Xiang Sun), and update the status of the gun issues during the start-up. (Yin-e Sun)

Education, Mentoring and outreach

- Helped get Joe Calvey situated with work/some training. We+Medani Sangroula will meet weekly to discuss collective effects. (Ryan Lindberg)

Safety and Required Training

- Completed ESH108400. (Kathy Harkay)
- Completed SEC101 training. (Jeff Dooling)

Miscellaneous

- Took 2 days of vacation (Ryan Lindberg)
- On vacation week 2/16th - 20th.. (Stan Pasky)
- Made machine study schedule for next week. (Aimin Xiao)